

Copidognathus (Halacaridae: Acari) from Western Australia: five species of the *oculatus* group

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Abstract – Five *Copidognathus* species, taken on the shores of Rottnest Island, Western Australia, are described. The five species, *C. culoatus* sp. nov., *C. facetus* sp. nov., *C. levigatus* sp. nov., *C. pumicatus* sp. nov., and *C. rasilis* sp. nov., can be attributed to the *Copidognathus oculatus* group. The *oculatus* group and the 28 species attributed to this group are diagnosed, the geographical distribution summarized in a map. The southern hemisphere proved to be more rich in species than the northern.

INTRODUCTION

The genus *Copidognathus* is cosmopolitan, found in marine, diluted brackish and even freshwater; in polar, temperate and tropical waters, from tidal areas down to deep sea basins. *Copidognathus* inhabits a variety of substrata, its members are found on and in sandy deposits, amongst colonial organisms, algae and vascular plants. Some few species are parasitic (Newell, 1956; Bartsch, 1976). Species belonging to *Copidognathus* are within a size range of 180–600 µm. The genus includes almost 300 species. Several natural groups have been recognized and diagnosed, examples are the *bairdi* group (Bartsch, 1984b, 1996, 1997b), *curassaviensis* group (Bartsch, 1996), *gibbus* group (Newell, 1971; Bartsch, 1977, 1994, 1997a), *pulcher* group (Bartsch, 1984a, 1992; Newell, 1984), *tricornatus* group (Bartsch, 1997c), and the *oculatus* group (Bartsch, 1977).

MATERIAL AND METHODS

Halacarid mites were collected by the author in January 1991 on Rottnest Island, Western Australia, while participating in the Fifth International Marine Biological Workshop. The halacarids were cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared using a camera lucida. Holotypes are deposited in the Western Australian Museum (WAM), paratypes in the WAM, the Zoological Institute and Museum, Hamburg (ZMH), and/or the author's halacarid collection (IB).

Abbreviations used in the descriptions: AD, anterior dorsal plate; AE, anterior epimeral plate; ds, dorsal setae on idiosoma, ds-1 to ds-6, first to sixth pair of dorsal setae; GA, genitoanal plate; GO, genital opening; mxs, maxillary setae; OC, ocular plate(s); P, palp, P-1 – P-4, first to fourth palpal

segment; pas, parambulacral setae; PD, posterior dorsal plate; PE, posterior epimeral plate; pgs, perigenital setae; pgs-1 and pgs-2, anteriormost and succeeding pair of pgs; sgs, subgenital setae; vs-3 pair of posteriormost ventral setae on AE. Legs numbered I to IV, leg segments 1 to 6, 1-6, tarsus on leg I.

SYSTEMATICS

Copidognathus oculatus group

Diagnosis

Dorsal and ventral plates large, areas with membranous integument narrow. Posterior margin of AD and anterior margin of PD truncate. Anterior margin of AD often tricuspid. Posteromedian raised areola on AD either oblong transverse or bow-shaped, sometimes lacking. Gland pores near lateral margins slightly posterior to level of insertion of legs I. OC elongate, posteriorly generally tail-like, extending beyond level of insertion of leg III. Pair of costae of PD slightly or not raised. PE extending far beyond insertion of leg IV. First pair of gland pores in lateral margins of AD, generally on level with insertion of leg I. Gland pores on PD inconspicuous. Setae ds-1 on AD between gland pores, within anterior margin of posteromedian areola; ds-2 in anteromedial edge of OC; ds-3 to ds-5 on PD. Opposing margins of AE and GA wide, almost truncate. AE with three pairs of ventral setae. PE with one dorsal and three ventral setae. Female genital sclerites with one pair of sgs. Male GA generally with postgenital papilla; perigenital setae arranged in a ring closely around GO. Male genital sclerites in general with one anterior pair and two posterior pairs of subgenital setae. Gnathosoma with one pair of maxillary setae on its base and one on rostrum; tip of rostrum with two pairs of rostral

setae. Tectum often with triangular process. P-2 with one dorsal seta; no seta on P-3; P-4 with three setae basally, one setula and two spurs apically. Legs shorter than idiosoma. Trochanters III and IV lack a distal spiniform process. Telo femur I 1.4–2.4 times longer than high, often with pair of very narrow ventral carinae. Telo femora highest in basal half. Telo femora and tibiae with small medial and lateral articular membranes. General number of setae (exceptions do exist!), from trochanter to tarsus (solenidium and parambulacral setae excluded): leg I, 1, 2, 5, 4, 7, 6; leg II, 1, 2, 5, 4, 7, 3; leg III, 1, 2, 2, 3, 5, 4; leg IV, 0, 2, 2, 3, 5, 3. Telo femora III and IV lack ventral setae. Tibiae I and II each with three ventral setae, i.e., generally two bipectinate ventromedial setae and one smooth, slender ventral seta. Tibiae III and IV each with two ventral setae; in the majority of species with one bipectinate ventromedial and one smooth ventral

seta. Solenidia on tarsi I and II setiform and dorsolateral in position. Tarsi I, III and IV with pair of fossary setae inserted within fossa area. Fossa membranes of tarsi III and IV small or inconspicuous. Pair of claws at end of tarsi each with accessory process and pecten. Claws and pectines on tarsi I and II rather similar in length. Median sclerite with claw-shaped process.

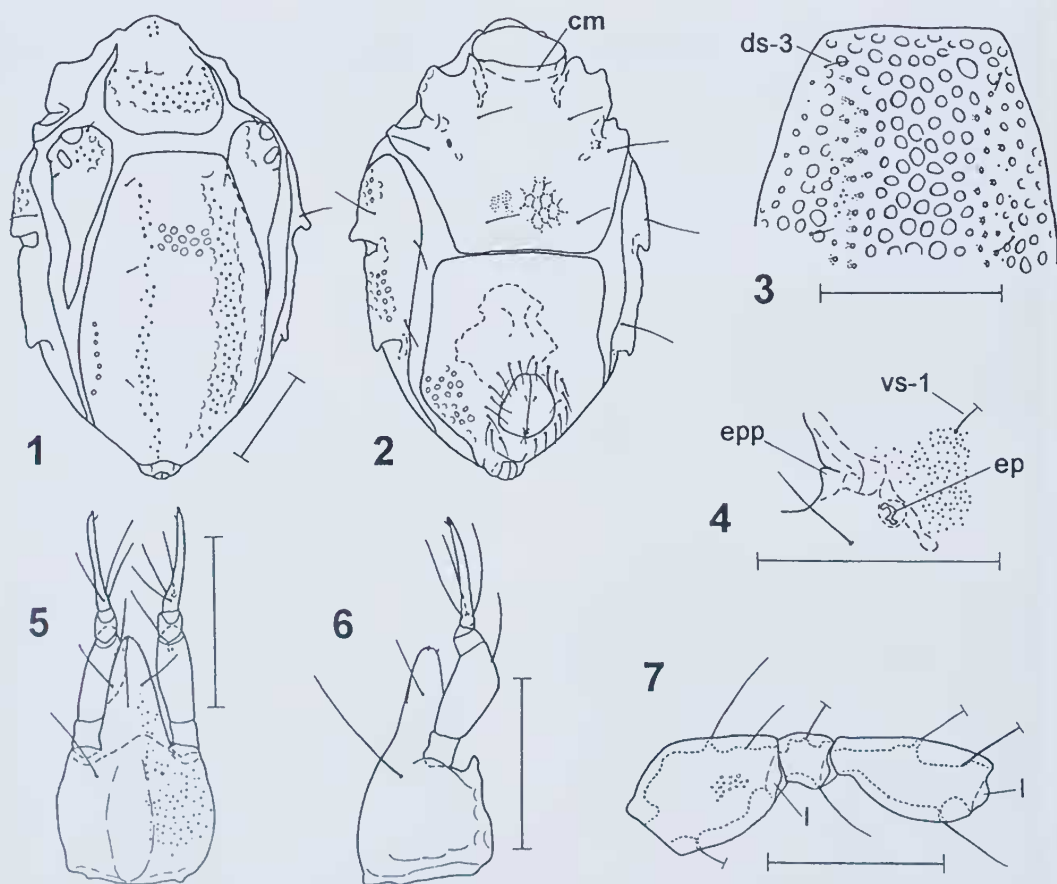
Copidognathus culoatus sp. nov.

Figures 1–14

Material Examined

Holotype

♂, Bickley Bay, Rottnest Island, Western Australia, Australia; 1.5 m depth; seagrass *Amphibolis* sp. covered with epiphytes and epizoans; 17 January 1991 (WAM 99/103).



Figures 1–7 *Copidognathus culoatus* sp. nov., ♂: 1, idiosoma, dorsal; 2, idiosoma, ventral; 3, anterior portion of PD; 4, part of AE with epimeral pore; 5, gnathosoma, ventral; 6, gnathosoma, lateral; 7, telo femur to tibia I, lateral aspect and optical section. (cm, camerostomal membrane; ds-3, third dorsal seta; ep, epimeral pore; epp, epimeral process; l, articular membrane; vs-1, anteriormost ventral seta on AE) Scale line = 50 µm.

Paratypes

Australia: Western Australia: 1 ♂, collection data same as for holotype (ZMH); 1 ♂, collection data same as for holotype (IB).

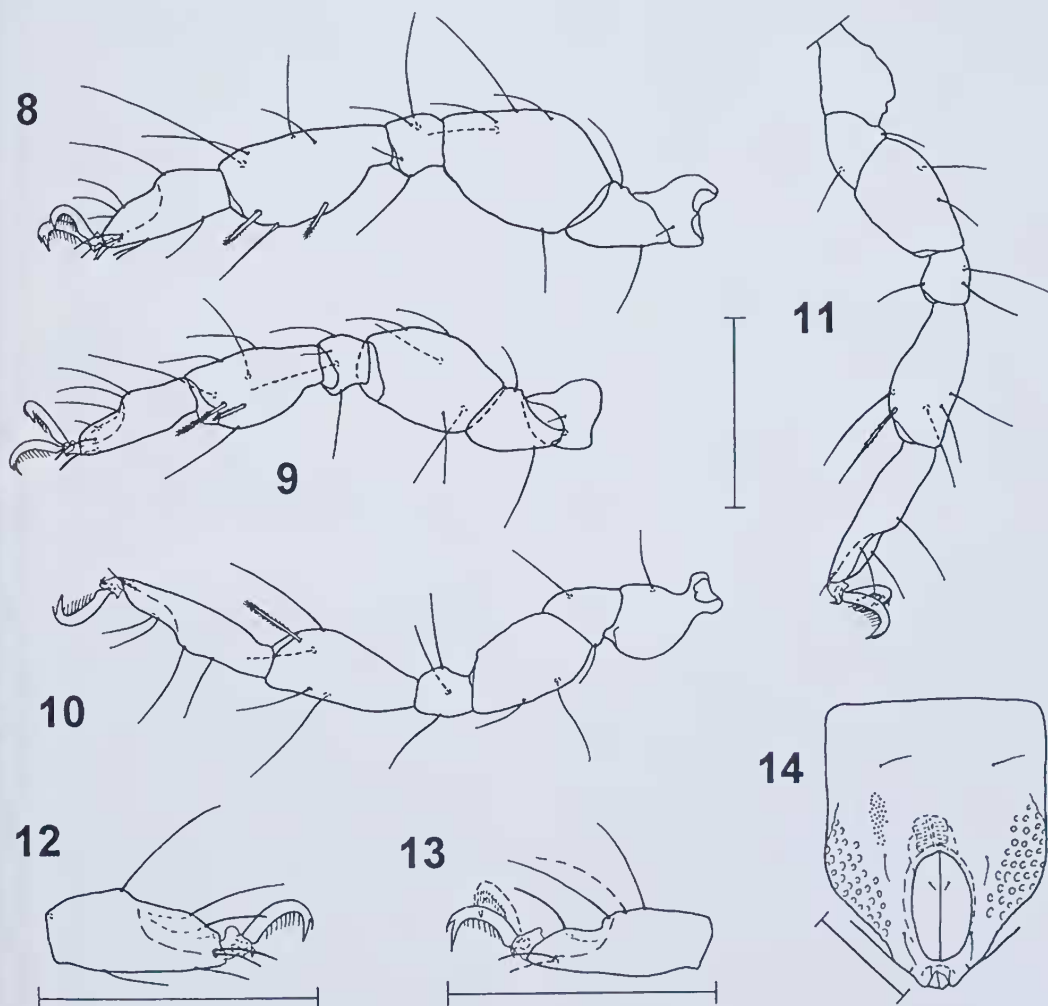
Other material examined

Australia: Western Australia: 1 ♀, Bickley Point; 0.5 m depth; *Amphibolis* sp. covered with epiphytes and epizoans, 18 January 1991 (WAM 99/104).

Description*Male*

Idiosoma 235–261 µm long, holotype 235 µm long. Dorsal plates with delimited porose areolae, remainder of plates foveate. Rosette pores within

porose areolae pycnic, with ostium, 1–2 µm wide, a similar wide alveolus, and almost reduced canaliculi. AD of holotype 60 µm long; with arched anteromedian margin and pair of small lateral protuberances where AD and dorsal portion of AE meet (Figure 1). Transverse porose areola 10 µm long, 40 µm wide. Pair of gland pores in lateral margins, level with anterior margin of transverse areola. OC 95 µm long, 32 µm wide; posterior cornea lightly constricted. Gland pore lateral to posterior cornea; pore canaliculus level posterior margin of that cornea. Tail-like posterior portion of OC rather wide, extending far beyond level of ds-4. Porose areola medial to corneae 12 µm in diameter. PD 158 µm long. Pair of long porose costae mainly two pores or 8–10 µm wide (Figure 3), rarely one



Figures 8–14 *Cupidognathus culoatus* sp. nov.: 8, leg I, medial, ♂; 9, leg II, ventromedial, ♂; 10, leg III, medial, ♂; 11, leg IV, medial, ♂; 12, tarsus I, lateral (medial setae and claw omitted), ♂; 13, tarsus II, lateral (medial setae and claw in broken line), ♂; 14, genital/anal plate, ♀. Scale line = 50 µm.

pore wide; costae extending antieriad to level of ds-3. Costae in posterior PD convergent but not meeting in the median. Foveae between and lateral to costae 5 μm wide. Pair of small lateral costae in posterior portion of PD. Dorsal setae small; ds-3 to ds-5 inserted lateral to medial costae.

Ventral portions of plates superficially almost evenly punctate; when focussing on deeper layers a faint reticulum present. Marginal portions of plates foveate (Figure 2). AE 92 μm long (with transverse camerostomal membrane included). Epimeral pores constricted by two times (Figure 4). Epimeral processes I at ventral aspect conical; epimeral processes II lamellar. GA 120 μm long; GO 32 μm long. Distance from GO to GA 1.8 times length of GO. Spermatopositor by 1.4 times length of GO surpassing GO. With 21–23, in holotype 22 pgs around GO. Postgenital papilla approximately 5 μm long and 11 μm wide; no pgs close to papilla.

Gnathosoma 74 μm long; 1.5–1.6 times longer than wide. Rostrum almost as long as gnathosomal base. Surface of gnathosomal base and basal portion of rostrum minutely pitted. Tectum triangular (Figure 5). Rostral sulcus extending beyond rostral pair of maxillary setae. P-4 almost as long as diagonal length of P-2 (Figure 6).

Legs distinctly shorter than idiosoma. Telfomora short; telfomora I and II 1.45 times longer than high; length:height ratio of telfomora III and IV 1.6–1.7 (Figures 8–11). Integument pitted. Telfomora I and II slightly longer than tibiae; telfomora III and IV slightly shorter than these legs' tibiae. Articular membranes on telfomur, genu and tibia I small (Figure 7). Basalmost bipectinate seta of tibia II near level of smooth ventral seta. Ventromedial seta on tibia III bluntly ending and bipectinate; that seta on tibia IV long, tapering, delicately serrate. Pair of distal fossary setae on tarsi I, III and IV on membranes of claw fossae. Tarsus II with distomedial seta in dorsal position, distolateral seta at basis of lateral membrane of claw fossa. Solenidion on tarsus I 11 μm long (Figure 12), on tarsus II 12 μm (Figure 13). Interval between two basal setae on tarsus III slightly less than height of tarsus. Parambulacral setae on tarsus I doublets, on tarsus II singlets.

Tines of claw pectines 3 μm long. Median sclerite with minute bidentate process; on tarsi II to IV upper tooth almost reduced.

Female

Idiosoma 258 μm long, 173 μm wide. Dorsal aspect same as in male. GA 127 μm long, 100 μm wide; posterolaterally with foveae and canaliculi; remainder of plate punctate. GO 50 μm long; distance to anterior margin of GA equalling 1.3 times length of GO. Ovipositor by 0.3 times length of GO extending antieriad beyond GO and far from

reaching level pgs-1 (Figure 14). Gnathosoma and legs as in male.

Remarks

Copidognathus culoatus is characterized by its transverse, rectangular areola on the AD; the two (to one) pores wide costae on the PD bearing small ostia and very reduced canaliculi; the scaliform postgenital papilla; and the short telfomora.

C. culoatus resembles *C. oculatus* and *C. modestus*. In contrast to *C. oculatus*, *C. culoatus* has smaller porose areolae on AD and PD, the canaliculi of the rosette pores are almost reduced, and the ovipositor is shorter.

The costae on the PD of *C. modestus* are as wide as in *C. culoatus*; in contrast to the latter species, the ventromedial seta on tibia IV is blunt, the female ovipositor extends almost to the pgs-1, and the males have 25–29 pgs.

Etymology

The name 'culoatus' is an anagram of 'oculatus'.

Copidognathus facetus sp. nov.

Figures 15–28

Material Examined

Holotype

♂, Duck Rock, Rottnest Island, Western Australia, Australia; 7–10 m depth; algal hapteres with epifauna; 9 January 1991 (WAM 99/105).

Paratype

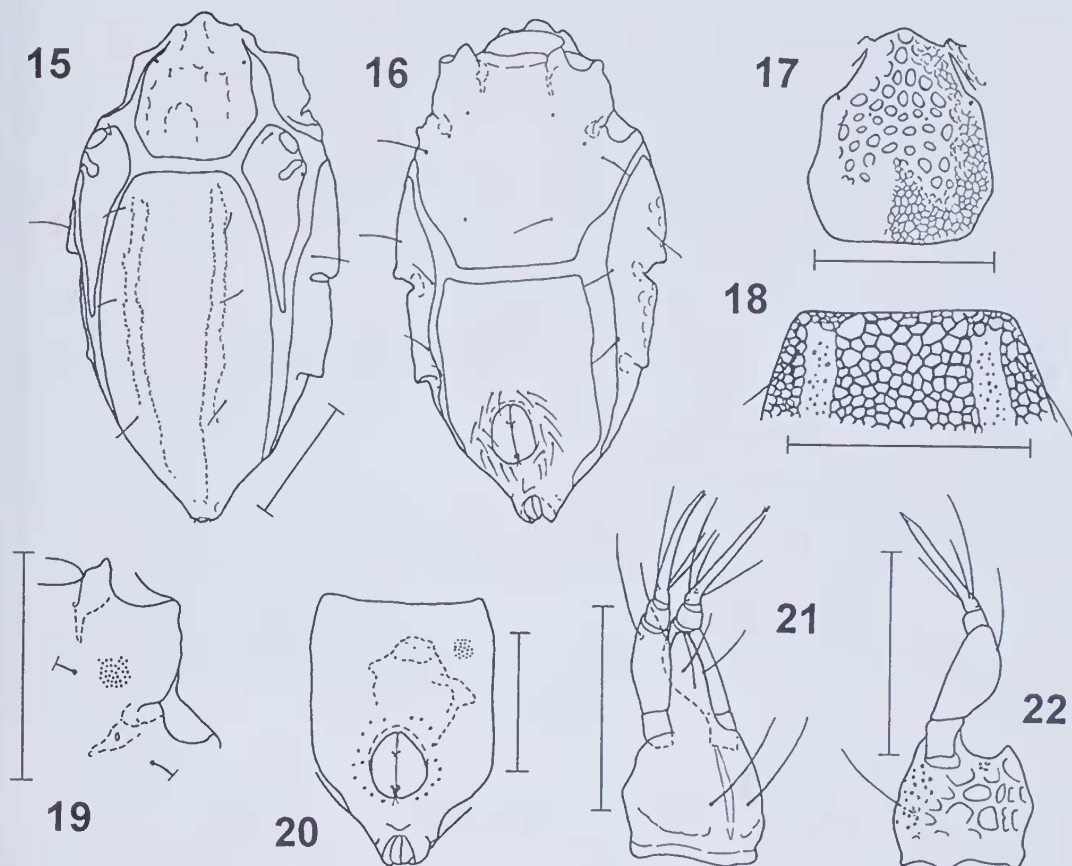
Australia: Western Australia: 1 ♂, collection data same as for holotype (IB).

Description

Male

Idiosoma 190–200 μm long, holotype 200 μm long. Dorsal plates foveate and reticulate; rosette pores lacking. AD 57 μm long; anterior margin with small, rounded median process (Figure 15). Raised areola similar to an inverted Y and ornamented with large foveae; remainder of plate minutely reticulate (Figure 17). OC 75 μm long, 26 μm wide; tail-like posterior portion extending just beyond level of ds-4. OC with two large corneae. PD 137 μm long. Pair of costae delimited, 5 μm wide, ornamented with small, faint foveae (Figure 18). Median and lateral portions of plate minutely reticulated; meshes of reticulum along anterior margin and in posterior portion of PD larger than in remainder of plate. Setae ds-3 to ds-5 long, inserted lateral to costae. Setae ds-6 small.

Major portions of ventral plates evenly punctate; small marginal areas foveate. AE 77 μm long (camerostomal membrane excluded). Epimeral



Figures 15–22 *Copidognathus facetus* sp. nov., ♂: 15, idiosoma, dorsal; 16, idiosoma, ventral; 17, anterior dorsal plate; 18, anterior portion of PD; 19, part of AE with epimeral pore; 20, genitoanal plate; 21, gnathosoma, ventrolateral; 22, gnathosoma, lateral. Scale line = 50 μ m.

processes lamelliform, very conspicuous (Figure 16). Epimeral pores small, ovate, not constricted by protruding teeth (Figure 19). GA 98 μ m long. Distance from anterior margin of GA to GO twice length of GO, distance from posterior margin of GO to end of anal cone same as length of GO. Spermatopositor large (Figure 20); extending far beyond GO.

Gnathosoma 60 μ m long, rostrum 27 μ m long. Dorsal flank of gnathosomal base coarsely foveate; ventral flank porose. Tectum triangular. Basal pair of maxillary setae moved to basal portion of gnathosomal base (Figure 21). Rostral sulcus extending beyond apical pair of maxillary setae. P-4 almost as long as diagonal length of P-2 (Figure 22).

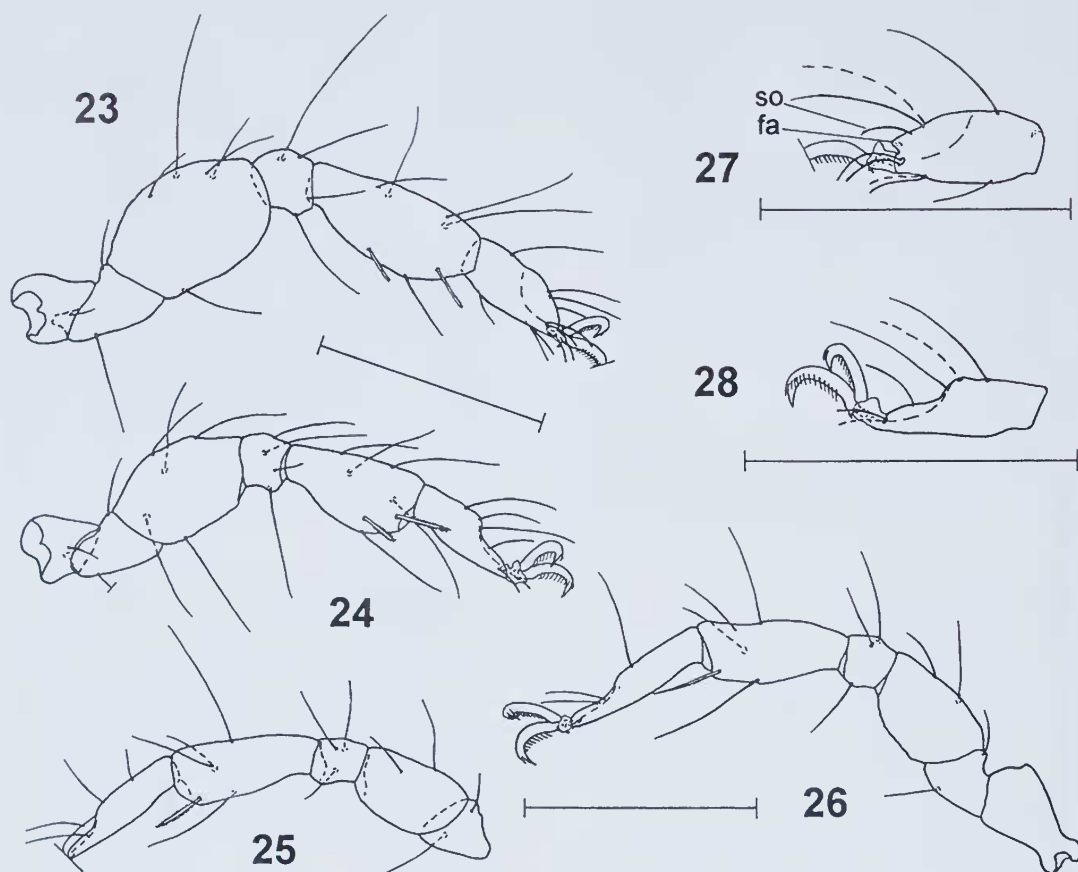
Legs I and IV almost equal in length; leg II smaller than leg I. Telfomera short, approximately 1.6 times longer than high (Figures 23–26); integument pitted. Legs I and II with telfomera about as long as tibiae; tibiae of legs III and IV longer than

telfomera. On tibia II basalmost bipectinate seta almost level smooth ventral seta. Ventromedial seta on tibia III blunt and delicately pectinate; that seta on tibia IV tapering, very delicately serrate. Tarsus I with pair of fossary setae on large fossa membranes; solenidion 9 μ m long; famulus lamelliform (Figure 27). On tarsus II fossary setae adjacent and near basis of fossa membranes (Figure 28); solenidion 10 μ m long, on lateral fossa membrane. Tarsi III and IV with narrow fossa membranes. Distance between two basal setae on tarsus III same as height of that segment. Tarsus I with pair of doubled pas, tarsus II with singlets.

Claws on leg I not markedly smaller than claws of succeeding tarsi. Each claw with accessory process and pecten. Median sclerite with minute claw-like process.

Female

Not seen.



Figures 23–28 *Copidognathus facetus* sp. nov., ♂: 23, leg I, medial; 24, leg II, ventromedial; 25, basifemur – tarsus III, medial; 26, leg IV, medial; 27, tarsus I, lateral (medial setae in broken line; medial parambulacral setae and claw omitted); 28, tarsus II, lateral (medial setae in broken line). (fa, famulus; so, solenidion) Scale line = 50 μ m.

Remarks

The most conspicuous characters of *Copidognathus facetus* are the small size (200 μ m) and the ornamentation of the AD and PD (raised areola on AD with large foveae; delimited costae on PD with faint, small foveae; remainder of plate minutely reticulated). Rosette pores are lacking.

The Antarctic *Copidognathus confusus*, the Chilean *C. foveolatus*, and the Caribbean *C. manubriatus*, too, lack rosette pores. The idiosoma of *C. confusus* is very slender, distinctly more slender than in *C. facetus*. In contrast to *C. facetus*, the male GO of *C. foveolatus* is larger relative to length of GA, the distance from GO to the anterior margin of the GA equals 1.7 times the length of GO, and the basal pair of maxillary setae is in normal position (in *C. facetus* the interval between GO and GA is twice the length of the GO, and the basal pair of the maxillary setae is in a more basal position). The

sculpturing of the AD and PD of *C. manubriatus* differs from that of *C. facetus*; namely in *C. manubriatus* the median areola on the AD is small and has indistinct pores, the remainder of the plate is covered with large foveae, whereas in *C. facetus* the median areola is large, bow-like, it bears large foveae, the areas outside the median areola are minutely reticulated.

Copidognathus krantzi, from Nicobar Islands, Bay of Bengal, is similar in size, the raised areola on the AD resembles that of *C. modestus*. Distinguishing characters are the costae of the PD (in *C. krantzi* with distinct pores, in *C. facetus* with minute foveae) and the insertion of the basal pair of maxillary setae.

Etymology

From 'facet' L. for gracile, referring to the gracile habitus.

Copidognathus levigatus sp. nov.
Figures 29–43

Material Examined

Holotype

♂, Little Armstrong Bay, Rottnest Island, Western Australia, Australia; 0.5 m deep; heavily encrusted seagrass *Posidonia* sp.; 16 January 1991 (WAM 99/106).

Paratypes

Australia: Western Australia: 1 ♀, collection data same as above (WAM 99/107); 1 ♀, collection data as above (ZMFH); 1 ♀, collection data as above (IB).

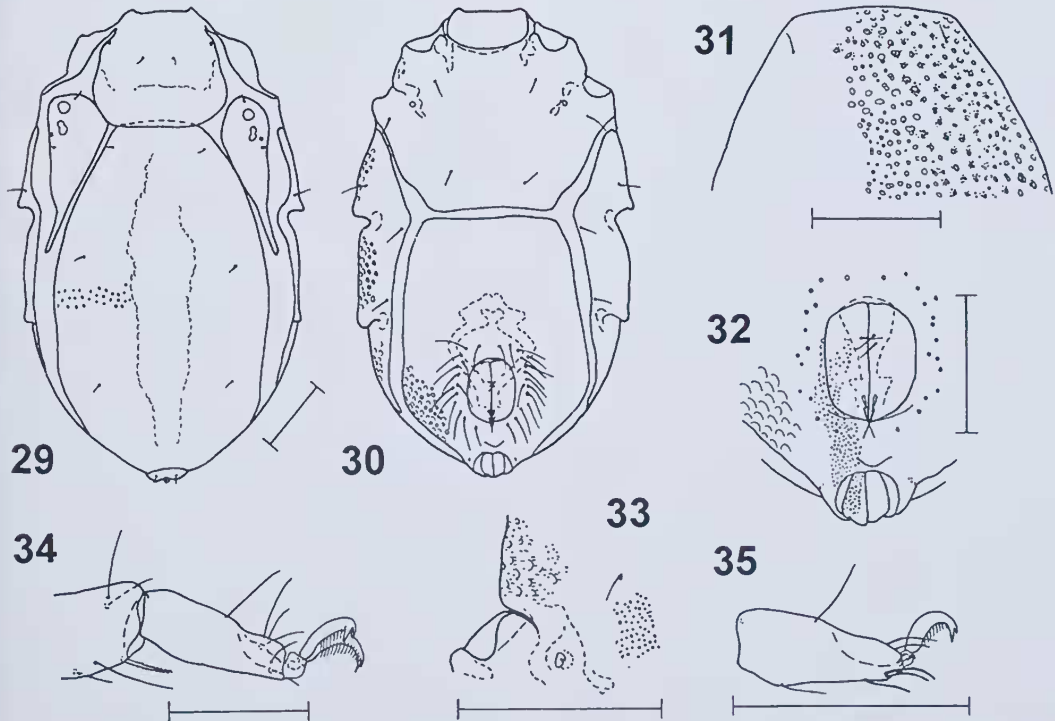
Description

Male

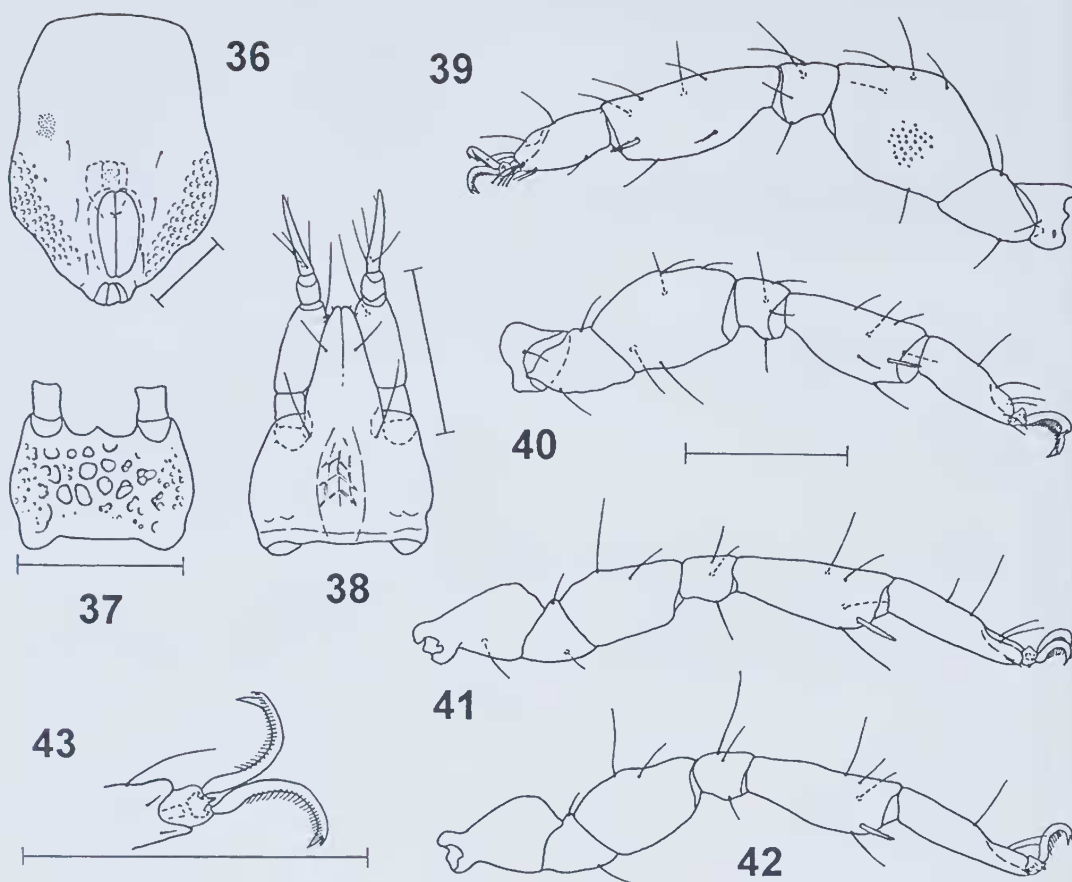
Idiosoma 323 µm long, 192 µm wide. Major parts of dorsal plates covered with small rosette pores, irregular in size and shape; remainder of plates foveate. AD 80 µm long, 92 µm wide; anteromedian margin truncate (Figure 29). Integument of anterior two-third slightly raised and with rosette pores; pores 2–5 µm in diameter, with three to ten

canaliculi each. Porose areola ending at transverse row of muscle scars (internal apodemes). Area posterior to series of scars approximately 27 µm long, integument covered with small foveae, each 2 µm in diameter. OC 112 µm long, 42 µm wide; extending backward beyond insertion of leg III and to level of ds-4. Anterior cornea circular, posterior cornea oblong, somewhat constricted. Area medial to corneae and along lateral margin of OC with rosette pores, remainder of plate foveate. PD 237 µm long, 148 µm wide. Pair of wide longitudinal 'costae' not raised; with rosette pores; anterior portion of 'costae' approximately five rosette pores wide; middle and posterior portion 10–13 rosette pores wide, or almost 50 µm wide. Median portion of PD oblong, 30 µm wide, with foveate ornamentation. Anterior portion of PD with transverse row of pycnic rosette pores at level of ds-3 (Figure 31). In posterior portion of PD areas with rosette pores meeting medially. Dorsal setae small; ds-1 within areola with rosette pores of AD; ds-4 and ds-5 within 'costae' of PD.

Marginal areas of ventral plates with rosette pores (Figure 30), large ventral portions uniformly porose. Posterior portion of GA covered with minute epicuticular droplets (Figure 32). Ventral setae



Figures 29–35 *Copidognathus levigatus* sp. nov., ♂: 29, idiosoma, dorsal; 30, idiosoma, ventral; 31, anterior portion of PD; 32, posterior portion of genitoanal plate; 33, part of AE with epimeral pore; 34, part of tibia and tarsus II, lateral; 35, tarsus I, lateral (medial setae and claw omitted). Scale line = 50 µm.



Figures 36–43 *Copidognathus levigatus* sp. nov., ♀: 36, genitoanal plate; 37, gnathosomal base, dorsal; 38, gnathosoma, ventral; 39, leg I, medial; 40, leg II, ventromedial; 41, leg III, medial; 42, leg IV, medial; 43, tip of tarsus IV, ventromedial (dorsomedial seta omitted). Scale line = 50 μ m.

slender and short. AE, with narrow camerostomal membrane included, 113 μ m long, 165 μ m wide. Epimeral processes I moderate in size, at ventral aspect 8 μ m long and 9 μ m wide; processes II 6 μ m long and 10 μ m wide. Epimeral pore with medial tooth (Figure 33). GA 179 μ m long, 132 μ m wide. GO 43 μ m long, 34 μ m wide; distance from anterior margin of GA to that of GO equalling 2.2 times length of GO. Spermatopositor short, 77 μ m long, 62 μ m wide; extending beyond GO by length of GO, and reaching to middle of interval between anterior margin of GO and GA. Postgenital papilla small. GO surrounded by 28 sgs. One genital sclerite with three the other with four sgs.

Shape of gnathosoma resembling that of female. Rostrum about as long as gnathosomal base and almost reaching to end of P-2. P-4 somewhat shorter than P-2.

Legs short. Surface of telofemora minutely pitted; ornamentation of tibiae less intense. Trochanters I

and II short. Dorsal and ventral setae short. Telofemur I 1.6 times longer than wide. Telofemur I of holotype unilaterally with six setae, four dorsal and two ventral setae. On each tibiae I and II basalmost ventromedial seta tapering, setiform and only very delicately serrate; apicalmost ventromedial seta wider, blunt and faintly bipectinate (Figure 34). Tibiae III and IV each with one wide ventromedial and one slender, smooth ventral seta. Solenidion on both tarsus I (Figure 35) and II 8 μ m long. On tarsus II, as on tarsus I, lateral fossary seta on fossa membrane, adjacent to dorsolateral solenidion; medial fossary seta on medial fossa membrane (Figure 34). Tarsus I with pair of doubled pas, tarsus II with pair of singlets; tarsus III with setiform medial and very minute lateral pas; both pas on tarsi IV very small. Interval between two basal setae on tarsus III equalling height of this segment. Tarsi III and IV with fossa membrane.

Claws on tarsus I slightly shorter than on succeeding tarsi. Each claw with accessory process. Pectines on claws III and IV conspicuously long, as in female (Figure 43).

Female

Idiosoma 340 μm long, 180 μm wide. Dorsal aspect resembling that of males. GA 177 μm long, 125 μm wide. GO 52 μm long, 28 μm wide. Genital sclerites with pair of short pgs. Interval between anterior margin of GA and GO twice length of GO. Ovipositor by less than half length of GO extending beyond GO, not reaching level of pgs-1 (Figure 36).

Gnathosoma 72 μm long, 56 μm wide, 1.3 times longer than wide. Rostrum 37 μm long. Ventral flank of gnathosomal base punctate, dorsal flank foveate, marginally reticulate; median process of tectum short (Figure 37). Rostral sulcus extending beyond apical pair of maxillary setae (Figure 38).

Leg I wider than leg II. Telofemora I and II 1.5–1.6 times longer than high (Figures 39 and 40); length:height ratio of telofemora III and IV 1.7 (Figures 41 and 42). Tibiae I and II slightly shorter than these legs' telofemora; tibiae III and IV longer than telofemora III and IV, respectively. Tarsi III and IV as long as tibiae.

Remarks

The most marked characters of *Copidognathus levigatus* are the large areolae with irregularly shaped rosette pores on AD and PD, the short telofemora I, and the long pectines on tarsi III and IV. The PD of *C. floridus* also has conspicuously wide porose costae, and the shape of leg I resembles that of *C. levigatus*. In contrast to *C. floridus*, the anterior margin of the AD of *C. levigatus* is truncate and the posterior margin of the porose areola almost transverse.

In contrast to the majority of species of the *oculatus* group, tarsus II of *Copidognathus levigatus* bears the dorsolateral fossary seta adjacent to the solenidion, on the fossa membrane.

Etymology

From 'levigatus' L., made smooth, referring to the dorsal plates which lack markedly delimited or raised areolae.

Copidognathus pumicatus sp. nov.
Figures 44–58

Material Examined

Holotype

♂, Bickley Bay, Rottnest Island, Western Australia, Australia; 1.5 m depth; seagrass *Amphibolis* with epiflora and epifauna; 17 January 1991 (WAM 99/108).

Paratype

Australia: Western Australia: 1 ♀, data same as for holotype (ZMH).

Description

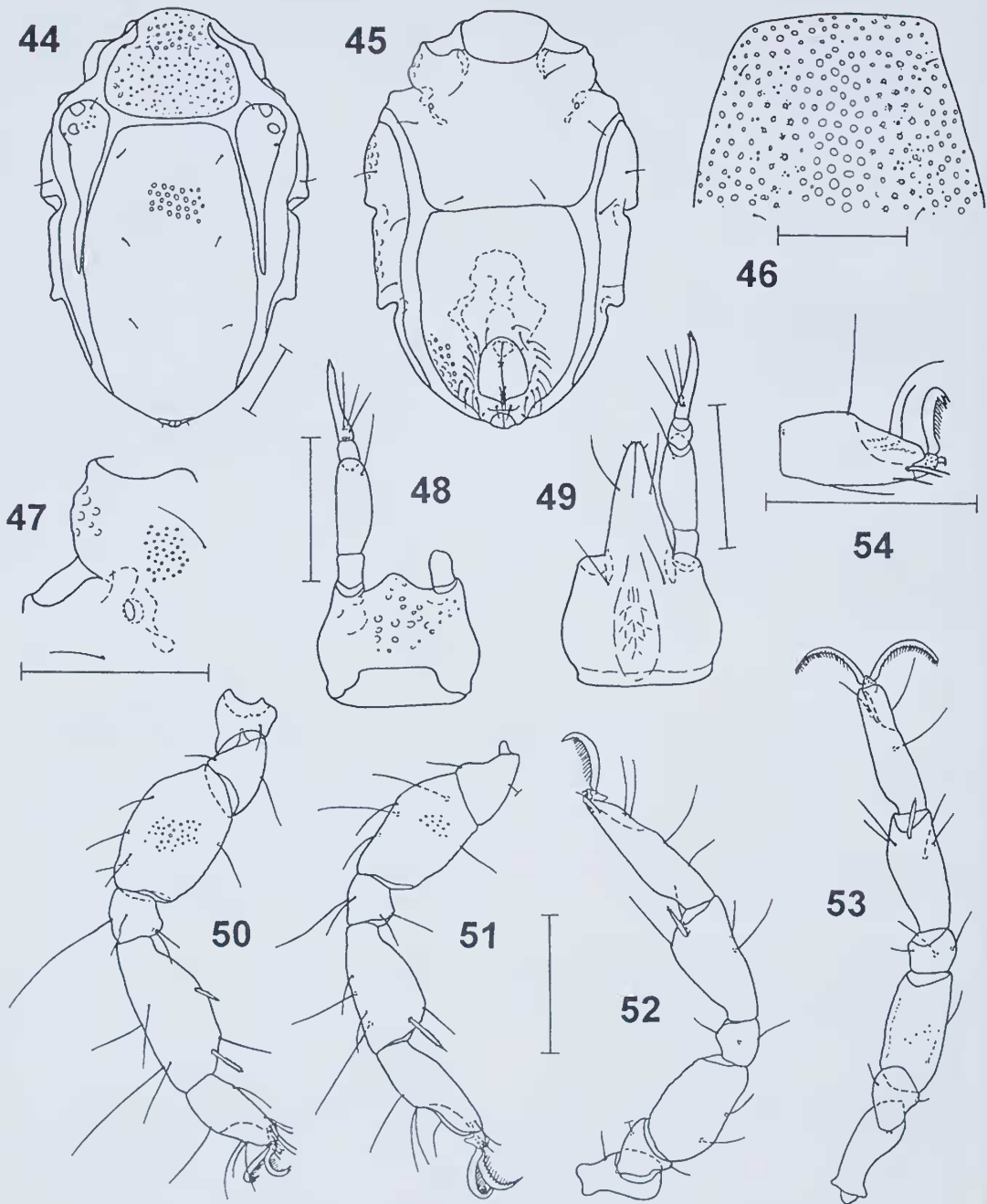
Male

Idiosoma 282 μm long, 186 μm wide. AD and PD rather uniformly covered with foveae, 2–4 μm wide; foveae within delicately raised areas somewhat smaller than foveae in remainder of plate. AD 75 μm long, 95 μm wide; anterior margin lightly arched (Figure 44). Bow-shaped raised areola extending almost to lateral margin of plate; approximately 10 of the small foveae in this area surrounded by four to five canaliculi. OC 117 μm long, 36 μm wide; extending posteriad distinctly beyond level of ds-4. Raised area lateral to two corneae with tiny foveae; foveae in remainder of OC 3–4 μm in diameter. PD 202 μm long, 120 μm wide; its 'costae' delicately raised, 20 μm wide; integument of 'costae' with scattered foveae surrounded by six to seven canaliculi; median portion of PD with larger foveae but no canaliculi (Figure 46). Setae ds-1 to ds-6 small; ds-4 and ds-5 well removed from lateral margins.

Ventral plates uniformly and coarsely porose; no reticulation recognizable. AE 97 μm long, 155 μm wide; epimeral processes small, first pair of processes rounded (Figure 45). Ovate stoma of epimeral pores not constricted by tines (Figure 47). Setae vs-3 close to posterior margin of AE. GA 152 μm long, 112 μm wide. GO 47 μm long, 35 μm wide, in posterior portion of GA. Portions lateral to GO with foveae; several of these foveae with canaliculi in deeper integumental layers. Distance from GO to anterior margin of GA equalling 1.9 times length of GO. Spermatopositor 95 μm long, 62 μm wide; by more than length of GO extending beyond GO, and reaching beyond middle of distance GO to GA. Genital sclerites with three pairs of sgs; beneath anterior portion of genital sclerites pair of ovate areas. Postgenital papilla transverse, narrow. GO surrounded by 23 pgs; posteriormost pair of pgs within basis of postgenital papilla.

Gnathosoma 86 μm long, 55 μm wide, 1.6 times longer than wide. Rostrum 42 μm long, 24 μm wide, slightly shorter than gnathosomal base. Gnathosomal base and basal portion of rostrum with minute foveae. Rostrum not quite extending to end of P-2 (Figure 49). P-4 slightly shorter than P-2. Median process of tectum rounded (Figure 48).

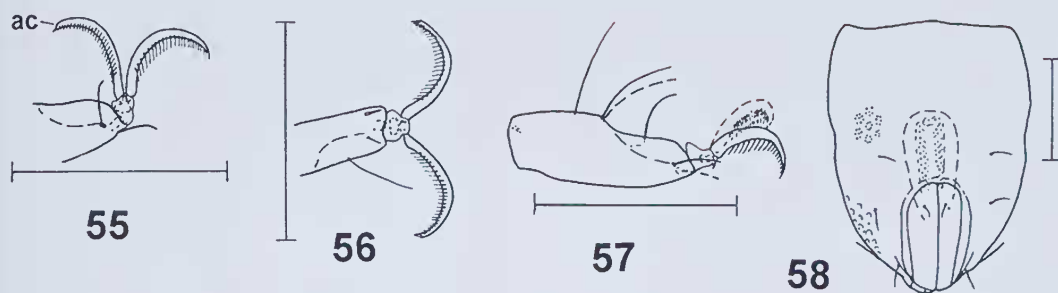
Legs I and IV (with claws included) subequal in length, 0.7 of idiosomal length. Surface of leg segments pitted. Membranes of claw fossa on tarsi II to IV delicately foveate. Telofemora I to IV 1.7 times longer than high (Figures 50–53). Tibiae of legs II, III and IV almost as long as the legs' telofemora. Tarsi III and IV somewhat longer than tibiae. Ventral setae on legs short. Tibia I ventrally



Figures 44–54 *Copidognathus puniceus* sp. nov., ♂: 44, idiosoma, dorsal; 45, idiosoma, ventral; 46, anterior part of PD; 47, part of AE with epimeral pore; 48, gnathosoma, dorsal; 49, gnathosoma, ventral; 50, leg I, medial; 51, basifemur – tarsus II, medial; 52, leg III, medial; 53, leg IV, ventromedial; 54, tarsus I, lateral (medial setae and claw omitted). Scale line = 50 μ m.

with two wide, pectinate setae and one slender, smooth seta. Tibia II ventrally with two setae, namely one bipectinate ventromedial seta and one smooth and slender ventrolateral seta; both setae

approximately 17 μ m long; dorsally with four setae. Tibiae III and IV each with one bipectinate and one slender, smooth seta. Solenidion on tarsus I 12 μ m (Figure 54), on tarsus II 13 μ m long. Two distal



Figures 55–58 *Copidognathus pumicatus* sp. nov.: 55, tip of tarsus II, ventral, ♂; 56, tip of tarsus IV, ventral, m (dorsolateral seta omitted); 57, tarsus II, lateral (medial setae and claw in broken line), ♂; 58, genitoanal plate, ♀. (ac, accessory process)

fossary setae on tarsus II adjacent near basis of medial fossa membrane (Figure 57). These two distal fossary setae on tarsi I, III and IV on fossa membranes. Distance between two basal setae on tarsus III almost equalling height of tarsus. Tarsus I with pair of doubled pas, tarsi II to IV with pair of singlets.

Claws on tarsi II to IV distinctly longer than those of tarsi I. Claws markedly slender; accessory process on claw I distinct; processes on claws II to IV tiny and moved to end of claws (Figures 55–57). Pecten extending almost from tip to basis of claw.

Female

Idiosoma 263 µm long. Outline of dorsal plates as in male. Ventral plates coarsely porose. GA 133 µm long, 100 µm wide. GO 55 µm long, 27 µm wide; minute foveae ornamenting surface of genital sclerites. Ovipositor large, by 0.6 times length of GO extending beyond anterior margin of GO, and reaching beyond anteriormost pair of pgs (Figure 58). Gnathosoma and legs as in male. Tibiae II as in male with one slender ventrolateral seta and single bipectinate ventromedial seta.

Remarks

The most conspicuous character in both the holotype and paratype of *Copidognathus pumicatus* is the absence of the second bipectinate seta on tibia II. The chaetotaxy resembles that of protonymphal stages of the genus *Copidognathus*. Other characters are: porose areolae on dorsal plates hardly delimited from remainder and bearing scattered and pycnic rosette pores, and the claws on tarsi II to IV being slender, with their accessory process moved to the tip of the claws and hence the pecten extending almost to this tip.

In *Copidognathus*, the number of setae on the tibiae is a generic character; tibiae I and II of adults have three ventral setae each, tibiae III and IV two setae each. In contrast, tibia II in the holotype and paratype of *C. pumicatus* has two ventral setae. All

the other characters of this species distinctly support the congenerity with *Copidognathus* and also the close relationship to the *oculatus* group.

Both the outline and the ornamentation of the dorsal plates resembles that of *C. levigatus*, but in *C. pumicatus* the areolae with the rosette pores are smaller, the vs-3 are closer to the posterior margin of the AE, the female ovipositor surpasses the anterior pgs; the male spermatopositor is much longer than in *C. levigatus*; and the pecten on each of the claws of tarsi III and IV extends almost to the tip of the claws.

The shape of the claws on tarsi II to IV, with the pectines extending to the tip, separates *C. pumicatus* also from all other species of the *oculatus* group.

Etymology

From 'pumico' L. for polish, referring to the posterodorsal plate that lacks distinctly delimited and raised costae.

Copidognathus rasilis sp. nov.

Figures 59–69

Material Examined

Holotype

♀, Nancy Cove, Rottnest Island, Western Australia, Australia; 0.1–0.5 m depth; encrustings on concrete pilings; 12 January 1991 (WAM 99/109).

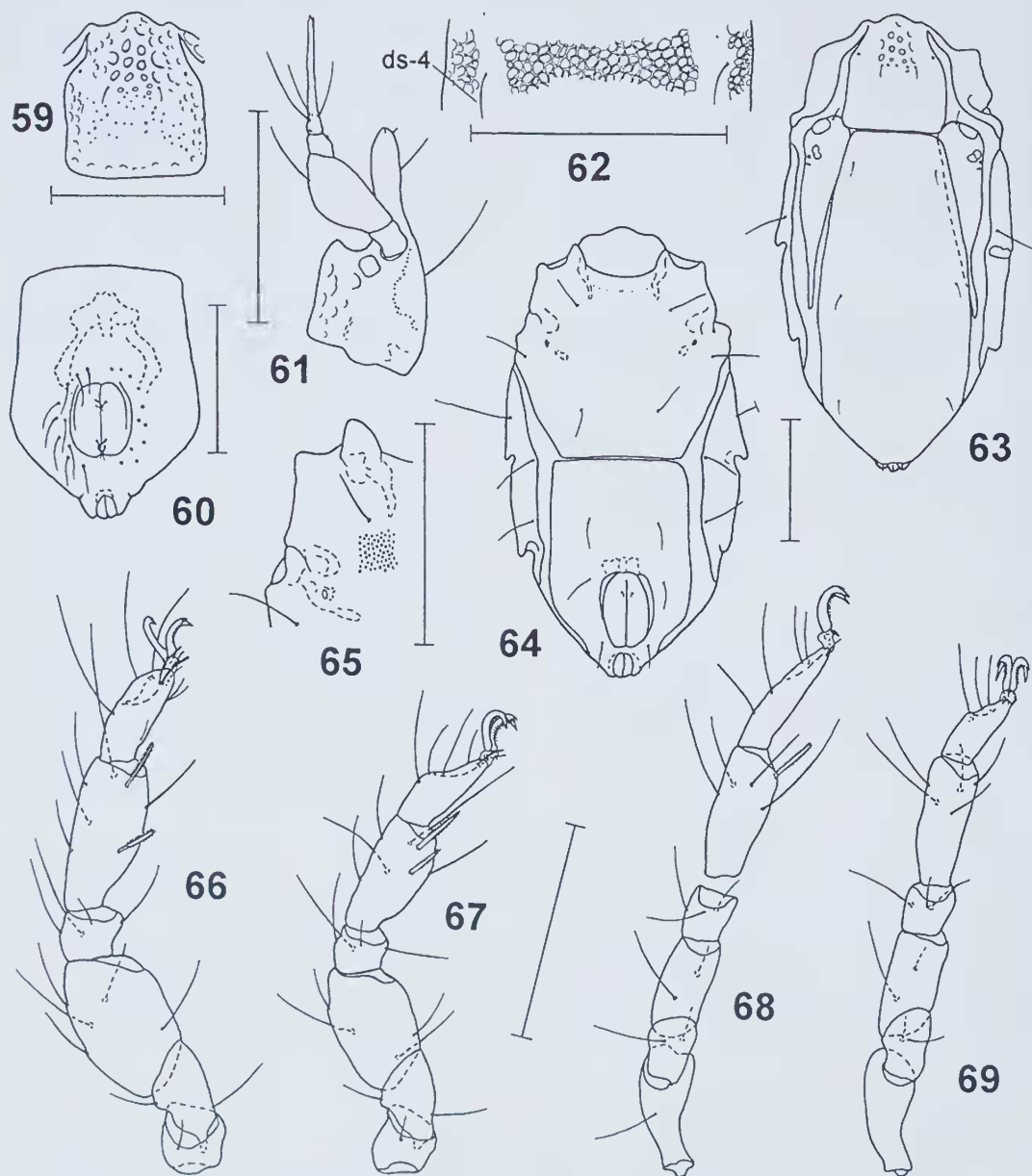
Paratype

Australia: Western Australia: 1 ♂, collecting as data as above (ZMH).

Description

Male

Idiosoma 174 µm long. Dorsal aspect similar to that of female. AD as in female 48 µm long, 42 µm wide; anterior margin of AD trilobed; anteromedian portion coarsely foveate, foveae 2–5 µm wide;



Figures 59–69 *Copidognathus rasilis* sp. nov.: 59, anterior dorsal plate, ♂; 60, genitoanal plate, ♂; 61, gnathosoma, lateral, ♂; 62, part of PD level with ds-4, ♀; 63, idiosoma, dorsal, ♀; 64, idiosoma, ventral, ♀; 65, part of AF with epimeral pore, ♀; 66, leg I, medial, ♀; 67, leg II, ventral, ♀; 68, leg III, ventral and lateral, ♀; 69, leg IV, ventral, ♀ (tarsus IV not in the same horizontal plane). (ds-4, fourth dorsal seta) Scale line = 50 µm.

lateral portions foveate-reticulate (Figure 59). PD 122 µm long, 67 µm wide; pair of 'costae' very faintly delimited from delicately and minutely reticulate remainder of plate. Setae ds-3, ds-4 and ds-5 lateral to 'costae'.

Ornamentation of ventral plates as in female. GA 87 µm long, 65 µm wide; plate uniformly punctate;

portions lateral to GO not foveate. GO 26 µm long, 22 µm wide. Distance from anterior margin of GA to GO equalling 1.6 times length of GO; distance from GO to end of GA slightly less than length of GO. Spermatopositor 47 µm long, 38 µm wide; by more than length of GO extending beyond GO. GO surrounded by 21 pgs (Figure 60). Genital sclerites

with three and four sgs. Postgenital papilla lacking.

Gnathosoma 60 μm long. Tectum with small median process. Rostrum not extending beyond P-2; rostrum shorter than gnathosomal base. P-4 slightly longer than P-2 (dorsal length) (Figure 61).

Legs I and IV similar in length. With claws included, length of these legs equalling 0.6 of idiosomal length. Telfemora I to IV with 5, 4, 2, 2 setae.

Female

Idiosoma 187 μm long, 98 μm wide. Anteromedian portion of AD conspicuously foveate, OC and PD very faintly and delicately reticulated. AD 48 μm long, 42 μm wide. Setae ds-1 within posterior margin of foveate areola. Transverse series of internal apodemes near posterior margin. OC 82 μm long, 20 μm wide; the posterior tail-like portion extending far beyond level of insertion of leg III and somewhat beyond level of ds-4 (Figure 63). Posterior cornea bi-lensed. PD 137 μm long, 65 μm wide. Pair of longitudinal costae hardly delimited from medial and lateral portions which bear small, very faint reticulation (Figure 62). Integument of costae almost smooth. Setae ds-3, ds-4 and ds-5 near lateral margin of PD.

Ventral plates delicately punctate. AE 75 μm long, 88 μm wide. Epimeral processes I almost 10 μm long and wide (Figure 64). Epimeral pores small, ovate (Figure 65). Distance between posterior pair of setae and margin of AE equalling 20 μm . PE elongate, area anterior and posterior to insertion of leg III similar in length. GA 90 μm long, 58 μm wide; GO 32 μm long, 24 μm wide. Distance from anterior margin of GO to GA equalling 1.3 times length of GO. Ovipositor short, by 7 μm extending beyond GO, far from reaching level of pgs-1.

Gnathosoma 65 μm long. Rostrum shorter than gnathosomal base. Venter punctate, dorsum coarsely foveate. Tectum with short median process. P-4 slightly longer than diagonal length of P-2.

Leg I larger than leg II; telfemora I and II 1.6–1.7 times longer than high (Figures 66 and 67). Tibiae I and II as long as telfemora of these legs. Telfemur II with four setae, two dorsal and two ventral ones. Tibiae I and II each with two bipectinate ventromedial setae; on tibia II basalmost bipectinate seta almost level smooth, tapering ventral seta. Tibia III with one short bipectinate seta (Figure 68); on tibia IV that ventromedial seta long, slender, tapering (Figure 69). Tarsi I, III and IV with two distal fossary setae on membranes of claw fossa; on tarsus II two distal fossary setae inserted adjacent near basis of fossa membranes.

Claws on tarsus I not markedly smaller than those on tarsus II. Each claw with accessory process and pecten. Median sclerite with small, bidentate process.

Remarks

Copidognathus rasilis is characterized by its small size and the almost smooth PD; rosette pores are lacking. *C. rasilis* is very similar to *C. facetus*, beside the differences in the ornamentation of the dorsal plates, the former's PD is much more slender and in the male the GO is closer to the anterior margin of the GA than in *C. facetus*. *C. rasilis* and *C. facetus* are expected to be sister species.

Copidognathus rasilis differs from all other members of the *oculatus* group in having a reduced number of setae on telfemur II; the basalmost dorsal seta is lacking in both the holotype δ and the paratype η . In the male, the postgenital papilla is reduced which is likely to be correlated with the general reduction of integumental structures of this small-sized species.

Etymology

From 'rasilis' L. for polished. In this species the posterodorsal plate is almost smooth, a distinct ornamentation such as delimited costae or large foveae is lacking.

GENERAL REMARKS AND NOTES ON BIOGEOGRAPHY

The *Copidognathus oculatus* group was diagnosed by Bartsch (1977), and seven species were attributed to the group. Newell's key group 5200 (Newell, 1984) to its major part is identical with the *oculatus* group; Newell (1984: 140) placed 13 species, mainly from the southern polar and cold-temperate zone, into that key group, viz. *C. auops*, *C. arcuatus*, *C. aricae*, *C. arnaudi*, *C. confusus*, *C. corneatus*, *C. floridus*, *C. foveolatus*, *C. hureaui*, *C. marcaudrei*, *C. porosus*, *C. vaulhoeffeni*, *C. ypsilophorus*. Another five species (*C. aequalivestitus*, *C. crypticus*, *C. commatops*, *C. granosus*, *C. sigillatus*), closely related to *C. oculatus*, are in key group 7700 (Newell, 1984: 181). In the same year, Bartsch (1984c) added the Caribbean species *C. manubriatus* and *C. modestus* to the *oculatus* group.

At present, the *oculatus* group comprises 28 species, doubtful species included. The following annotated list is mainly compiled according to the descriptions of the species and not based on personal microscopic studies; misinterpretations may have occurred. The species *C. aricae* and *C. arcuatus*, by Newell (1984) attributed to the key group 5200, are not included in the list of species; both obviously are not closely related to *C. oculatus*.

As shown in the map (Figure 70), the *oculatus* group is present world-wide, in polar, temperate as well as in tropical areas. Representatives of the group have been taken in the littoral, sublittoral and bathyal zone. Noteworthy is the diversity of the fauna on the southern hemisphere. In the Antarctic region (the Antarctic continent, the Palmer

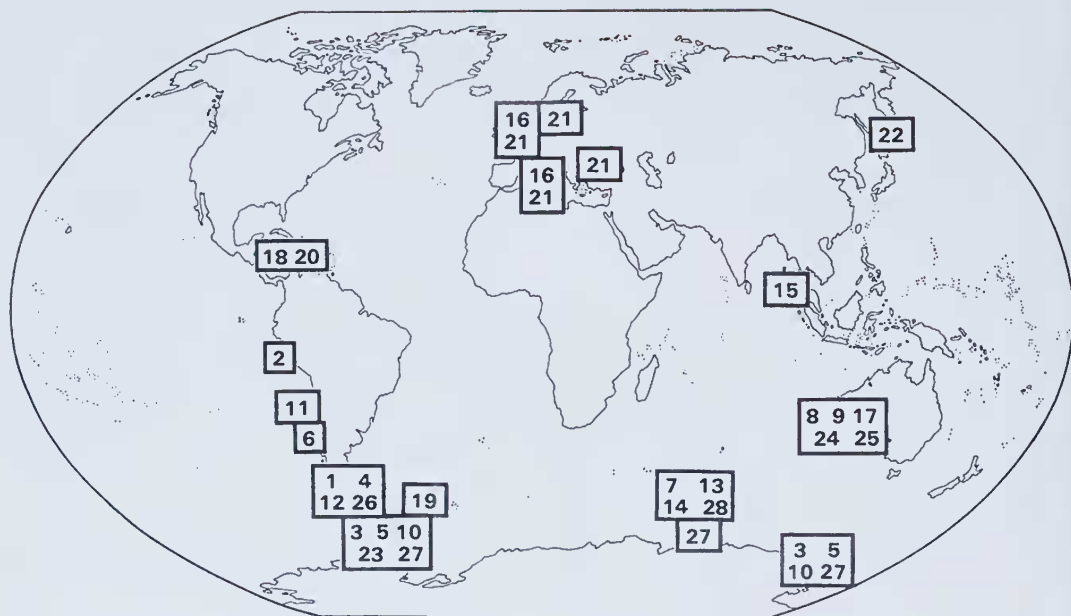


Figure 70 Geographical distribution of the *Copidognathus oculatus* group 1, *aequalivestitus*; 2, *anops*; 3, *arnaudi*; 4, *commatops*; 5, *confusus*; 6, *corneatus*; 7, *crypticus*; 8, *culoatus*; 9, *facetis*; 10, *floridus*; 11, *foveolatus*; 12, *granosus*; 13, *hureaui*; 14, *kerquelenensis*; 15, *krantzi*; 16, *latisetus*; 17, *levigatus*; 18, *manubriatus*; 19, *marcandrei*; 20, *modestus*; 21, *oculatus*; 22, *pacificus*; 23, *porosus*; 24, *pumicatus*; 25, *rasilis*; 26, *sigillatus*; 27, *vanhoeffeni*; 28, *ypsiphorus*.

Peninsula and the islands south of the convergence zone) six out of the seven *Copidognathus* species proved to belong to the *oculatus* group (Bartsch, 1993); these are *C. arnaudi*, *C. confusus*, *C. floridus*, *C. marcandrei*, *C. porosus*, and *C. vanhoeffeni*. The species *C. aequalivestitus*, *C. commatops*, *C. crypticus*, *C. granosus*, *C. hureaui*, *C. kerguelensis*, *C. marcandrei*, *C. sigillatus*, and *C. ypsiphorus* are recorded from Subantarctic waters, namely the shores of southern South America, South Georgia, and Kerguelen Islands. Several species both within and between the Antarctic and Subantarctic region are almost identical in general facies, nonetheless, the species of the Antarctic and Subantarctic region are distinct and no species is known to inhabit both areas. On the Northern hemisphere, *C. latisetus* and *C. oculatus* live in the northeastern Atlantic and adjacent seas, and *C. pacificus* in the northwestern Pacific Ocean. No member of the *oculatus* group is recorded from the shores of the cold-temperate northwestern Atlantic ocean. Species from warm-water areas are *C. manubriatus* and *C. modestus*, present in the Caribbean area, and *C. krantzi*, in the Bay of Bengal. An undescribed species from the Philippines is in the author's halacarid collection. The fauna of Rottnest Island, Western Australia, known to harbour both tropical and temperate elements (Wells and Walker, 1993) proved to contain five species of the *Copidognathus oculatus* group.

Of the five species of the *oculatus* group taken on

the shores of Rottnest Island, *C. levigatus* and *C. pumicatus* as well as *C. facetis* and *C. rasilis* demonstrate close similarities in the external characters which clearly separate these couples from other species. The couples *C. levigatus* / *C. pumicatus* and *C. facetis* / *C. rasilis* are supposed to be sister species.

ANNOTATED LIST OF SPECIES

The list includes 28 species of the *oculatus* group; reliable descriptions are given in square brackets.

Copidognathus aequalivestitus Viets, 1950 [Viets, 1950]

Diagnosis

Idiosoma 295–335 µm long. Major parts of dorsal plates almost evenly pierced by canaliculi; marginal areas with porose panels. Rosette pores lacking. Tail-like posterior portion of OC extending posteriad far beyond level of ds-4. Ventral plates uniformly porose. Epimeral processes I small. Ovipositor extending distinctly beyond anterior pair of pgs. Male GA with 24–26 pgs; spermatopositor large, by 1.3 times length of GO extending beyond GO. Basis of postgenital papilla with one pair of pgs. Gnathosoma 1.8 times longer than wide; rostrum extending to end of P-2.

Telofemur I delicately and minutely foveate, 1.6 times longer than high. Tarsus II with two distal fossary setae at basis of claw fossa. Tibiae III and IV each with bipectinate ventromedial seta. Claw pectines with distinct tines.

Remarks

In the type series, housed in the ZMH, the OC end with an elongate tail which extends far beyond the insertion of leg III.

C. aequalivestitus can be identified with help of the uniformly porose dorsal and ventral plates.

Distribution

Falkland Islands; 16 m depth; gravel, shell and algae (Viets, 1950).

Copidognathus anops Newell, 1971 [Newell, 1971, 1984]

Diagnosis

Idiosoma 326 µm long. Porose areolae with rosette pores. Posterior porose areolae on AD bridge-like. OC posteriorly acuminate, not caudiformly elongated, extending to insertion of leg III. PD with pair of narrow costae, one-pore wide. Epimeral processes I long. Ovipositor not reaching to pgs-1. Gnathosoma 1.5 times longer than wide. Tectum with median process. Tip of rostrum not reaching end of P-2. Telofemur I relatively short. Ventromedial seta on both tibia III and IV bipectinate. Claw pecten present.

Remarks

In contrast to the majority of species of the *oculatus* group, the OC of *C. anops* are not caudiformly prolonged. The costae of the PD of *C. corneatus*, *C. marcandrei*, *C. porosus*, and *C. vanhoeffeni*, species with rather short OC, are distinct from the narrow, one-pore wide costae of *C. anops*.

Distribution

Off Peru; 1,565 m depth; rocky bottom (Newell, 1971, 1984).

Copidognathus arnaudi Newell, 1984 [Newell, 1984; Bartsch, 1993]

Diagnosis

Idiosoma 290–360 µm long. Porose areolae with deep pores (ostium and alveolus but no canaliculi); remainder of dorsal plates foveate. Posteromedian areola on AD bow-shaped. Posterior portion of OC caudiform, reaching just beyond level of ds-4. Medial costae on PD five to nine pores wide; lateral costae present. Porose areolae within margins of PE and GA with rosette pores (small surficial ostia;

canaliculi in deeper integumental layers); ventral portions of AE, PE and GA with punctate panels. Epimeral processes I distinct but short. Ovipositor reaching halfway between pgs-1 and pgs-2. Male GO surrounded by 24 pgs. Spermatopositor extending midway between distance GO – GA. No pgs at basis of postgenital papilla. Gnathosoma 1.6 times longer than wide. Rostrum extending to end of P-2. Tectum with median process. Telofemur I panelled, 1.5 times longer than high. Ventromedial seta on both tibia III and IV bipectinate. Paired fossary setae on tarsus II at basis of claw fossa. Tarsi III and IV with membranes of claw fossa greatly reduced. Claw pectines with long, slender tines.

Remarks

C. arnaudi resembles *C. aequalivestitus* in general facies but the ornamentation of the dorsal and ventral plates is different.

Distribution

Terre Adélie, South Shetland Islands, Palmer Archipelago; 12–370 m depth; hydrozoans, sponges, holdfasts of brown algae (Newell, 1984; Bartsch, 1993).

Copidognathus commatops Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 284–314 µm long. Posteromedian areola of AD slightly longer than wide. Long, caudiform posterior portion of OC extending distinctly beyond level of ds-4. PD with pair of costae, each three rosette pores wide. Rosette pores with large ostia and numerous canaliculi. Remainder of plate strongly panelled. Ventral plates uniformly punctate. Epimeral process I low. Ovipositor extending anteriorly just beyond pgs-1; that pair of setae at 0.4 relative to length of GA (from anterior to posterior). Male GO surrounded by approximately 50 pgs (21–30 on each side). Spermatopositor by length of GO extending beyond GO. Postgenital papilla well developed; flanked by isolated pair of pgs. Tectum of gnathosoma gently rounded. Telofemur I minutely and uniformly reticulate, 1.4 times longer than high. Ventromedial seta on both tibia III and IV bipectinate. On tarsus II, two distal fossary setae inserted almost adjacent near basis of claw fossa. Claw pectines well developed.

Remarks

Newell (1984) attributed *C. commatops* both to the key group 5200 and to 7700.

Approximately one-third of the species of the *oculatus* group have small or reduced epimeral processes I. *C. commatops* can be separated from the

other species with small epimeral processes on the basis of the shape and ornamentation of the porose areolae.

Distribution

Chile, near Punta Arenas; low to midtidal zone; very coarse sand (Newell, 1984).

Copidognathus confusus Newell, 1984 [Newell, 1984; Bartsch, 1993]

Diagnosis

Idiosoma slender, 355–360 μm long. Dorsal plates lack distinct rosette pores. Median areola on AD foveate. Tail-like posterior portion of OC reaching level of ds-4. PD almost three times longer than wide; panelled; some specimens with single row of weakly developed pores within costae. Epimeral processes extremely minute. Marginal portions of ventral plates foveate, ventral portions delicately pitted. Ovipositor extending beyond GO but far from reaching level of pgs-1. Male GO surrounded by 30 pgs. Spermatopositor reaching halfway between distance from anterior margin of GO to GA. Postgenital papilla moderate in size. Gnathosoma slender. Rostrum extending to end of P-2. Telofemur I reticulate; length twice the height. Fossa membranes of tarsi II, III and IV almost completely reduced. Paired fossary setae on tarsus II dorsal in position, not within area of claw fossa. Claw pectines with small tines.

Remarks

C. confusus can be identified on the basis of its very slender idiosoma.

Distribution

Terre Adélie, Palmer Archipelago (Newell, 1984; Bartsch, 1993).

Copidognathus corneatus Newell, 1971 [Newell, 1971, 1984]

Diagnosis

Idiosoma 305–331 μm long. Porose areolae with rosette pores. Posterior areola of AD bridge-like. Caudiform posterior portion of OC rather short, not quite reaching level of ds-4. Costae of PD widened between ds-4 and ds-5. Anterior portion of costa one pore wide; within widened area two to three pores wide. Plate outside costae panelled. Marginal areolae of AE, PE and GA with rosette pores. Epimeral processes narrow. Ovipositor not reaching level of pgs-1. Male with almost 30 pgs (13–15 on each side). Spermatopositor extending distinctly beyond ring of pgs. No pgs near basis of postgenital papilla. Gnathosoma slender, approximately 1.6

times longer than wide. Rostrum not reaching end of P-2. Tectum with median process. Telofemur I panelled, its length twice the height. Tibia III and IV each with bipectinate ventromedial seta. Membranes of claw fossa absent on tarsi III and IV. Tines of claw pectines poorly developed.

Remarks

C. corneatus has acuminate, but no caudiform OC, plates as *C. anops* has. In contrast to the latter species, the costae on the PD have a widened porose areola and the telofemora are slender. *C. vanhoeffeni*, with the costae on the PD widened as in *C. corneatus*, has more slender telofemur I.

Distribution

Off Chile; 485 m depth (Newell, 1971, 1984).

Copidognathus crypticus Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 324–355 μm long. Posteromedian areola of AD large, oval, with 25–35 typical rosette pores. Caudiform posterior portion of OC extending to ds-4. PD uniformly covered with prominent, circular panels, some of which show poorly developed rosette pores; no costae present. Ventral plates with widely spaced porose panels. Epimeral processes absent. Ovipositor extending beyond pgs-1. Male with 12–14 pgs on either side of GO. Spermatopositor large, extending far beyond ring with pgs. Postgenital papilla large; with pair of pgs at its basis. Tectum of gnathosoma heavily panelled, median process bluntly rounded. Integument of telofemora delicately reticulate and with canals. Telofemur I 1.3 times longer than high. Ventromedial seta on both tibia III and IV bipectinate. Tarsus II with two distal fossary setae inserted adjacent at basis of claw fossa. Tarsi III and IV with fossa membranes. Claw pectines with tines.

Remarks

In contrast to the similar *C. aequalivestitus*, the porose areolae of *C. crypticus* contain typical rosette pores.

Distribution

Kerguelen; 15 m depth; holdfasts of brown algae (Newell, 1984).

Copidognathus culoatus sp. nov.

Diagnosis

Idiosoma 235–261 μm long. Porose areolae of dorsal plates with pycnic rosette pores (with ostium and alveolus but almost reduced canaliculi).

Remainder of plate foveate. Posteromedian areola on AD transverse. OC posteriorly tail-like, extending far beyond level of ds-4. Medial costae of PD one to two pores wide. Lateral costae small. Ventral plates marginally with porose areolae; ventral portions punctate. Epimeral processes distinct. Ovipositor far from reaching level pgs-1. Male GO surrounded by 21–23 pgs. Spermatopositor extending far beyond midline between GO and GA. None of pgs inserted directly at basis of postgenital papilla. Gnathosoma 1.5–1.6 times longer than wide. Tectum triangular. Rostrum not quite reaching end of P-2. Telofemur I minutely pitted, 1.45 times longer than high. Pair of fossary setae on tarsus II near basis of claw fossa. Tines of pectines distinct.

Distribution

Western Australia; 1.5 m depth; seagrass *Amphibolis* sp.

Cupidognathus facetus sp. nov.

Diagnosis

Idiosoma 190–200 µm long. Rosette pores lacking. On AD raised areola like an inverted 'Y' coarsely foveate. Tail-like posterior portion of OC reaching beyond level ds-4. Costae on PD narrow, faintly foveate; remainder of plates minutely reticulated. Small marginal areolae of AE, PE and GA delicately foveate; ventral portion evenly punctate. Epimeral process I enlarged. Male GO surrounded by 20 perigenital setae. Spermatopositor extending far beyond GO. No pgs at basis of postgenital papilla. Rostrum not reaching end of P-2. Tectum with small median process. Telofemur I 1.5–1.6 times longer than high; its integument minutely pitted. Ventromedial seta on tibia III delicately pectinate; that seta on tibia IV slightly serrate. Tarsus II with both fossary setae at basis of claw fossa. Tarsi III and IV with narrow membranes of claw fossa. Tines of claw pectines distinct.

Distribution

Western Australia; 7–10 m depth; algal hapteres with epifauna.

Cupidognathus floridus Trouessart, 1914
[Trouessart, 1914; Newell, 1984; Bartsch, 1993]

Diagnosis

Idiosoma 380–430 µm long. Shape of porose areolae on AD like inverted 'Y' (anteromedian and posteromedian areola fused); with rosette pores. Posterior portion of OC caudiform, not quite reaching level of ds-4. Porose costae on PD faintly delimited, at least 10 pores wide; each pore with alveolus but without canaliculi. Remainder of plate

foveate. Setae ds-3 to ds-5 well removed from margin of PD. Marginal porose areolae of PE and GA with canaliculi. AE anteriorly prolonged, collar-like. Epimeral processes I short, pointed. Ovipositor reaching halfway between pgs-1 and pgs-2. Gnathosoma slender, length more than twice its width. Rostrum extending distinctly beyond P-3. Tectum with triangular process. Telofemora with panels and scattered pores. Length:height ratio of telofemur I 1.4–1.5. On tarsus III, basidorsal seta close to basal fossary seta. Tines of claws distinct.

Remarks

C. floridus can be separated from congeners on the basis of the collar-like anterior AE.

Distribution

Palmer Archipelago, Terre Adélie; shallow water; amongst sponges and algae (Newell, 1984; Bartsch, 1993).

Cupidognathus foveolatus Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 188–207 µm long. Rosette pores absent. Posteromedian areola of AD with large foveae. Outside antero- and posteromedian areola plates minutely pitted. Caudiform posterior portion of OC reaching beyond ds-4. Costae of PD with uniform pattern of minute pores. Ventral plates evenly punctate; they lack porose areolae. Epimeral processes well developed. Ovipositor not reaching level of pgs-1. Male GO with about 24 pgs (11–13 on each side); large spermatopositor extending well beyond ring of pgs. No pgs at basis of postgenital papilla. Length:width ratio of gnathosoma 1.7. Rostrum slender but not reaching end of P-2. Telofemora short; telofemur III 1.6 times longer than high. Both distal fossary setae of tarsus II at basis of claw fossa. Tarsi III and IV with fossary lamellae. Claw pectines with long tines.

Remarks

C. foveolatus has the basal pair of maxillary setae in normal position, whereas in the similar *C. facetus* these setae insert more basally.

Distribution

Off Chile, islands San Felix and Juan Fernandez; intertidal; on algae (Newell, 1984).

Cupidognathus granosus Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 365 µm. Posteromedian areola of AD

transverse, oval. Posterior caudiform portion of ocular plate extending far beyond ds-4. Costae on PD distinct only in posterior portion of plate, here two to three rosette pores wide. AE and PE with marginal areolae. Epimeral process I low, shelf-like. Male GO surrounded by about 28–30 pgs. Spermatopositor by more than length of GO extending beyond GO. Pair of pgs at basis of well developed postgenital papilla.

Remarks

In contrast to other species of the *oculatus* group, the costae with rosette pores are present only in the posterior portion of the PD.

Distribution

Chile, near Punta Arenas; low to midtidal zone; very coarse sand (Newell, 1984).

Copidognathus hureaui Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 294–344 μm long. Dorsal plates with rosette pores. Posteromedian porose areolae of AD small, transverse elliptical. Posterior portion of OC long, tail-like. Medial costae on PD feebly developed, with scattered, irregularly formed rosette pores and coarse pores. Lateral costae small, slightly raised. Remainder of PD panelled. Epimeral process I small, pointed. Ovipositor not reaching to pgs-1. Spermatopositor extending halfway between anterior margin of GO and GA. GO surrounded by approximately 36 pgs. Postgenital papilla very long, with pair of pgs at its basis. Gnathosoma slender; length more than twice its width. Rostrum extending beyond P-3. Telofemur I 1.7–1.8 times longer than high. Ventromedial seta on both tibia III and IV delicately bipectinate. Tarsus II with two distal fossary setae adjacent at basis of claw fossa. Tarsus IV with four dorsal setae. Tarsi III and IV lack fossary lamellae. Tines of pectines distinct.

Remarks

C. hureaui has a very slender rostrum and, unique within the *oculatus* group, tarsus IV bears four dorsal setae.

Distribution

Kerguelen; 15 m depth; holdfasts of brown algae (Newell, 1984).

Copidognathus kerguelensis (Lohmann, 1907)
[Lohmann, 1907; André, 1933]

Diagnosis

Idiosoma 400 μm long. Anterior portion of PD

more narrow and reticulation coarser than in *C. oculatus*, else similar to *C. oculatus*. OC long, tail-like. Gnathosoma 1.6 times longer than wide. Rostrum short, far from reaching end of P-2 (Lohmann, 1907: Fig. 12; André, 1933: Figs 7–9).

Remarks

The majority of species of the *oculatus* group have a slender rostrum that extends almost to the end of P-2, in contrast, the rostrum of *C. kerguelensis* is very short.

Distribution

Kerguelen, amongst algae from shallow water (Lohmann, 1907; André, 1933; Newell, 1984).

Copidognathus krantzi Chatterjee, 1992
[Chatterjee, 1992]

Diagnosis

Idiosoma 175–185 μm long. Posterior porose areola on AD bow-shaped, with rosette pores. Pair of costae on PD two rosette pores wide. Tail-like posterior portion of OC extending posteriad beyond level of ds-4. Ventral portions of AE, PE and GA punctate. Epimeral processes I well developed. Posterolateral portion of GA with rosette pores. Ovipositor short, not extending beyond pgs-1. Rostrum extending to end of P-2. Telofemora short. Tines of claw pectines distinct.

Remarks

In contrast to other small-sized members of the *oculatus* group with similar porose areolae (*C. facetus*, *C. foveolatus*, *C. manubriatus*), the AD, PD and GA of *C. krantzi* bear rosette pores.

Distribution

Nicobar Islands; amongst bunches of the green algae *Halimeda* (Chatterjee, 1992).

Copidognathus latisetus Viets, 1940 [Viets, 1940;
Bartsch, 1977]

Diagnosis

Idiosoma 248–290 μm long. Porose areolae of dorsal plates with rosette pores, remainder of plate reticulate, each panel subdivided. Posteromedian areola on AD transverse, oval. Posterior caudiform portion of OC reaching distinctly beyond level of ds-4. Costae on PD two rosette pores wide. PE and GA marginally with large porose areolae; ventral portions of plates punctate. Ovipositor not reaching level of pgs-1. Male with 12–15 pgs on each side of GO.

Spermatopositor not reaching beyond midline between distance GO – GA. Postgenital papilla large, with one pair of pgs. Gnathosoma 1.6–1.7 times longer than wide. Tectum with median process. Rostrum extending almost to end of P-2. Panels on telofemora minutely reticulated. Telofemur I 1.7–1.9 times longer than wide. Tarsi III with four dorsal setae; distance between two basalmost setae more than height of the segment. Ventromedial seta on both tibia III and IV blunt and bipectinate. Fossa membranes on tarsi III and IV inconspicuous. Claw pectines with numerous tines.

Remarks

C. latisetus is separated from the syntopic *C. oculatus* on the basis of its more slender idiosoma, gnathosoma and telofemora.

Distribution

Mediterranean, northeastern Atlantic, North Sea; shallow water, from tidal to 42 m depth; sandy deposits, algae, subtidal barnacles (Viets, 1940; Bartsch, 1977, 1980, 1985; Green and MacQuitty, 1987).

Copidognathus levigatus sp. nov.

Diagnosis

Idiosoma 323–340 µm long. Dorsal plates with large areas with rosette pores, remainder foveate. Integument of large anterior almost rectangular portion of AD with rosette pores. Posterior tail-like portion of OC extending to level of ds-4. Longitudinal porose areolae on PD not raised; anteriorly five rosette pores wide, in middle 10–13 rosette pores wide. Pycnic rosette pores present also in anteromedian and posteromedian portion of PD. Setae ds-4 and ds-5 within longitudinal porose areola. Ventral plates marginally with rosette pores, large ventral portions uniformly porose. Epimeral processes I moderate in size. Ovipositor not reaching level with pgs-1. Spermatopositor short, reaching halfway between distance from GO to anterior margin GA. Postgenital papilla small. Male GO surrounded by 28 pgs. Gnathosoma 1.3 times longer than wide. Tectum with short median spine. Rostrum extending almost to end of P-2. Integument of telofemora minutely pitted. Telofemur I 1.6 times longer than wide. Ventromedial seta bipectinate both on tibiae III and IV. On tarsus II, lateral fossary seta on fossa membrane, adjacent to dorsolateral solenidion. Pectines on claws III and IV conspicuously long.

Distribution

Western Australia; 0.5 m depth; heavily encrusted seagrass *Posidonia* sp.

Copidognathus manubriatus Viets, 1936 [Viets, 1936; Bartsch, 1984c]

Diagnosis

Idiosoma 180–207 µm long. Major parts of dorsal plates reticulate to foveate; raised areolae very faintly foveate, at low magnification smooth; rosette pores lacking. Raised areola on AD rectangular. OC posteriorly tail-like, extending beyond level with ds-4. PD with pair of costae. Ventral plates uniformly punctate. Epimeral processes I enlarged. Ovipositor short, hardly extending beyond GO. Gnathosoma approximately 1.5 times longer than wide. Rostrum not reaching end of P-2. Tectum triangular. Telofemora 1.5–1.6 longer than high. Tibiae III and IV each with one pectinate ventromedial and one smooth ventral seta. Tarsus II with pair of fossary setae near basis of claw fossa. On tarsus III, interval between two basalmost setae slightly more than height of that segment. Tarsi III and IV with narrow membranes of claw fossa. Claw pectines with delicate tines.

Remarks

C. manubriatus resembles *C. facetus* and *C. foveolatus* in respect to size of the idiosoma and ornamentation of the plates. The ovipositor of *C. manubriatus* is much shorter than in *C. foveolatus*, and the basal pair of maxillary setae is not in a basal position as in *C. facetus*.

Distribution

Caribbean area; shallow water (Viets, 1936; Bartsch, 1984c).

Copidognathus marcandrei Viets, 1950 [Viets, 1950; Newell, 1984; Bartsch, 1993]

Diagnosis

Idiosoma 470–500 µm long. Porose areolae of dorsal plates with rosette pores. Posteromedian areola on AD bow-shaped. Posterior portion of OC elongate, pointed but not tail-like, not reaching level of ds-4. PD with pair of large medial and small lateral costae; medial costae in anterior half one to two rosette pores wide. Integument outside costae panelled. Marginal and lateral porose areolae of ventral plates with rosette pores; ventral areas punctate. Epimeral processes I moderately developed. Ovipositor almost extending to pgs-1. Male GO surrounded by 46 pgs. No pgs at basis of postgenital papilla. Gnathosoma 1.7 times longer than wide. Rostrum not reaching end of P-2. Length of telofemur I equalling twice its height; integument panelled. Tibiae III and IV ventrally each with one bipectinate and one smooth seta. Distance between two basal setae on tarsus III more than height of that segment. Fossa membranes on tarsi II to IV reduced. Claw pectines with large tines.

Remarks

Short OC as in *C. marcandrei* are also present in *C. anops*, *C. corneatus*, *C. porosus*, and *C. vanhoeffeni*. In *C. corneatus* and *C. vanhoeffeni*, the costae of the PD have porose swellings, similar swellings are not present in *C. marcandrei*. *C. anops* is much smaller than *C. marcandrei*, and the costae of its PD are one pore wide. In *C. porosus* the arrangement of the costae, the ovipositor, and the male pgs is different from that of *C. marcandrei*.

Distribution

South Georgia; 22 m depth; algae (Viets, 1950).

Copidognathus modestus Bartsch, 1984 [Bartsch, 1984c]

Diagnosis

Idiosoma 253–263 µm long. Raised areolae of dorsal plates with rosette pores; remainder of plate foveate. AD with transverse areola. Tail-like posterior portion of OC extending far beyond insertion of leg III. Medial costae of PD one to three rosette-pores wide. Marginal areas of ventral plates with rosette pores, ventral areas punctate. Epimeral process I pointed. Ovipositor almost reaching level of pgs-1. Male GO surrounded by 25–29 pgs. Spermatopositor large. No pgs at basis of postgenital papilla. Rostrum not reaching end of P-2. Tectum with median triangular process. Telofemora I and II pitted, short, 1.5–1.6 times longer than high. Tibiae III and IV each with one ventromedial pectinate seta and one smooth ventral seta. Tarsus II with pair of fossary setae inserted almost dorsally. Tarsi II to IV with narrow fossa membranes. Claw pectines with distinct tines.

Remarks

C. modestus is most similar to *C. culoatus* and *C. oculatus*. Discriminating characters are mentioned after the diagnosis of *C. oculatus*.

Distribution

Caribbean area; shallow water (Bartsch, 1984c).

Copidognathus oculatus (sensu Lohmann, 1889) [Lohmann, 1889; Bartsch, 1977]

Diagnosis

Idiosoma 270–322 µm long. Dorsal plates with rosette pores. Integument outside raised areolae coarsely foveate. Posteromedian areola on AD wide, transverse. Posterior portion of OC tail-like, extending far beyond level of ds-4. Costae on PD approximately three rosette pores wide. Large marginal and lateral porose areolae on PE and GA

with rosette pores; ventral portions of ventral plates punctate. Epimeral process I well developed. Ovipositor almost reaching to pgs-1. Male GO surrounded by 25–30 pgs. Spermatopositor extending beyond middle of distance GO – GA. Postgenital papilla large, with pair of pgs near its basis. Gnathosoma 1.4–1.5 times longer than wide. Rostrum not reaching end of P-2. Telofemur I minutely reticulate, 1.4–1.5 times longer than high. Tibiae III and IV each with one bipectinate and one smooth seta. Tarsi III and IV with narrow fossa membranes. Claw pectines with large tines.

Remarks

The taxonomic status of *Copidognathus oculatus* is used in the sense of Lohmann (1889), Bartsch (1977) and Green and MacQuitty (1987).

C. oculatus, *C. modestus* and *C. culoatus* are very similar in size and ornamentation, but in *C. oculatus*, the porose areolae are larger, the costae on the PD much wider than in the two other species.

Distribution

Black Sea, Mediterranean, northeastern Atlantic, North Sea, Baltic; lower intertidal down to 1400 m; on sediment, epifauna and epiflora (Lohmann, 1889; Viets, 1956; Bartsch, 1977, 1979, 1985; Green and MacQuitty, 1987). The deep-water record is from the Bay of Biscay (Trouessart, 1896).

Copidognathus pacificus Makarova, 1975 [Makarova, 1975]

Diagnosis

Idiosoma 372 µm long. Anterior margin of AD with median process. Tail-like posterior portion of OC extending far beyond insertion of leg III. PD with pair of medial and pair of lateral costae. Epimeral processes I well developed. Male GA with approximately 50 (?) pgs. Shape of gnathosoma not known. Telofemora I short, approximately 1.4 times longer than high.

Remarks

According to Makarova (1975), the species resembles *C. oculatus*. The description is too fragmentary for detailed comparison.

Distribution

Kurilen Islands (Makarova, 1975, 1977).

Copidognathus porosus Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 490–540 µm long. Porose areolae of

dorsal plates with rosette pores. Posteromedian areola on AD bow-shaped. OC posteriorly pointed, elongate but not tail-like, slightly extending beyond insertion of leg III but far from reaching level ds-4. PD with pair of raised medial and lateral costae; medial costae three to five rosette pores wide, towards posterior end six pores wide; lateral costae lack similar rosette pores. Areas between costae panelled, each panel pitted. Large marginal and lateral areolae of AE, PE and GA with rosette pores; remainder of plate punctate, often arranged within polygons. Epimeral processes I small, rounded. Ovipositor reaching halfway between pgs-1 and pgs-2. Male GO surrounded by approximately 50 pgs. Rostrum extending to end of P-2. Telofemora coarsely panelled, each panel pitted. Telofemur I 2.0–2.1 times longer than high; ventral margin delicately serrate. Ventromedial seta of tibia IV bipectinate as that seta of tibia III. Distance between two basal setae on tarsus III more than the height of this segment. Membranes of claw fossa on tarsi III and IV reduced. Tines of claw pectines minute.

Remarks

C. porosus is one of the large-sized species within the *oculatus* group. It is similar to *C. marcandrei* but its OC are shorter, the porose costae on the PD wider, and the ovipositor is shorter than in *C. marcandrei*.

Distribution

Palmer Archipelago, Anvers Island; 13 m depth; brachiopods shells, algae, mud (Newell, 1984; Bartsch, 1993).

Cupidognathus pumicatus sp. nov.

Diagnosis

Idiosoma 263–285 µm long. AD and PD rather uniformly covered by foveae; raised areas with slightly smaller foveae. Posteromedian areola on AD very wide. Posterior tail-like portion of OC extending beyond ds-4. Costae on PD only delicately raised, scattered foveae surrounded by canaliculi. Ventral plates coarsely porose. Epimeral process I small, rounded. Ovipositor extending anteriorly far beyond pgs-1. Male GA with 23 pgs. Spermatopositor large, extending beyond middle line of distance GO to GA. Genital papilla small. Gnathosoma 1.6 times longer than wide. Rostrum almost extending to end of P-2. Median process of tectum rounded. Integument of telofemora foveate. Telofemur I 1.7 times longer than high. Distance between two basal setae of tarsus II slightly less than segment's height. Claws on posterior tarsi slender; accessory processes of claws II to IV tiny

and moved to end of claws; pectines long; tines of pectines long.

Distribution

Western Australia; 1.5 m depth; seagrass *Amphibolis* sp.

Cupidognathus rasilis sp. nov.

Diagnosis

Idiosoma 174–187 µm long. Rosette pores lacking. Anterior portion of AD foveate. Posterior tail-like OC extending far beyond level of insertion of leg III and somewhat beyond ds-4. Faintly delimited costae of PD almost plain; remainder of plate minutely reticulate. Ventral plates delicately punctate. Epimeral process I long. Ovipositor short, only slightly extending beyond GO and far from reaching to pgs-1. Male GO surrounded by 21 pgs. Large spermatopositor reaching far beyond middle of interval between GO and GA. Postgenital papilla lacking. Tectum of gnathosoma with small median process. Rostrum extending almost to end of P-2. Telofemur I 1.6–1.7 times longer than high. Ventromedial seta on tibia III short and bipectinate, on tibia IV long, slender, tapering. Tarsus II with pair of fossary setae near basis of claw fossa. Distance between two basal setae on tarsus III almost equalling height of that segment. Tarsi III and IV with narrow membranes of claw fossa. Tines of claw pectines small.

Distribution

Western Australia; 0.1–0.5 m depth; encrustings on concrete pilings.

Cupidognathus sigillatus Newell, 1984 [Newell, 1984]

Diagnosis

Idiosoma 334 µm long. Dorsal plates with rosette pores. AD with large porose areola, anteromedian and posteromedian areola fused. Posterior caudiform portion of OC extending distinctly beyond ds-4. Ventral plates punctate. Epimeral processes absent. Ovipositor extending anteriorly well beyond pgs-1. Male with 12–14 pairs of pgs. Spermatopositor extending beyond GO by 1.2 length of GO, i.e. beyond half the distance GO – GA. Postgenital papilla prominent. Telofemur I 1.7 times longer than high.

Remarks

C. sigillatus resembles *C. aequalivestitus*; the most marked difference is the presence of rosette pores in the porose areolae of *C. sigillatus* vs the uniform punctation without any ostia and alveoli in *C. aequalivestitus*.

Distribution

Chile; near Punta Arenas; holdfasts of brown algae (Newell, 1984).

Copidognathus vanhoeffeni (Lohmann, 1907)

[Lohmann, 1907; Newell, 1984; Bartsch, 1974, 1993]

Diagnosis

Idiosoma 341–433 μm long. Dorsal plates panelled. Bow-shaped raised median areola of AD with pycnic canaliculi. Attenuate posterior portion of OC not reaching level of ds-4. Pair of median costae of PD widened at level of insertion of leg IV; anterior half of costae plain; widened areolae with 9–11 rosette pores; posterior portion with foveae. Small lateral costae lack rosette pores. Marginal and lateral areolae on PE and GA with rosette pores; remainder of plate minutely reticulated. Epimeral process I small, rather inconspicuous. Ovipositor reaching halfway between pgs-1 and pgs-2. Spermatopositor extending distinctly beyond ring with approximately 30 pgs. Postgenital papilla present. Length:width ratio of gnathosoma 1.7. Rostrum far from reaching end of P-2. Tectum with triangular process. Telofemur I panelled, each panel minutely reticulated; length more than twice its height. Ventromedial seta on both tibia III and IV bipectinate. Distance between two basalmost setae on tarsus III more than height of tarsus. Membranes of claw fossa on tarsi III and IV reduced. Claw pectines with numerous delicate tines.

Remarks

The OC of *C. vanhoeffeni* are distinctly longer than figured in Newell (1984: Figure 339). Both *C. vanhoeffeni* and *C. corneatus* are characterized by a porose swelling in the costae of the PD. *C. vanhoeffeni* is somewhat larger than *C. corneatus*, the former's telofemur I is more slender. *C. confusus* lacks the porose swellings on the PD, and the GO in both female and male are placed more distally than in *C. vanhoeffeni*.

Distribution

Wilhelm II Coast, Terre Adélie, Palmer Archipelago; 46–385 m (Lohmann, 1907; Newell, 1984; Bartsch, 1974, 1993).

Copidognathus ypsilophorus Newell, 1984

[Newell, 1984]

Diagnosis

Idiosoma 324–355 μm long. Dorsal plates with prominent areolae with rosette pores. Porose areolae on AD fused to form an inverted 'Y'. Slender, caudiform portion of OC reaching about midway between insertions of legs III and IV.

Costae on PD wide, in middle of the plate five to seven rosette pores wide. Ventral plates coarsely punctate. Epimeral process I well developed. GA of female and male with porose areolae (rosette pores) lateral to GO. Ovipositor surpassing GO but far from reaching level of pgs-1. Male GO surrounded by 25 pgs. Postgenital papilla shelf-like. Gnathosoma 1.3 times longer than wide. Rostrum extending to end of P-2. Telofemur I 1.3 times longer than high. Tibia III and IV both with bipectinate ventromedial seta. Tarsi III and IV lacking membranes of claw fossa. Claw pectines well developed.

Remarks

The AD of both *C. ypsilophorus* and *C. floridus* has a porose areola resembling an inverted 'Y'. In *C. floridus* the porose areolae on the PD are much wider than in *C. ypsilophorus*. The female GA of *C. floridus* is longer relative to the GO and the insertion of pgs-1.

Distribution

Kerguelen; 15 m depth; holdfasts of brown algae (Newell, 1984).

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